CARBON MONOXIDE MAINTENANCE PROVISIONS

FOR SALT LAKE CITY

Section IX, Part C.7

Adopted by the Air Quality Board
August 7, 1996

TABLE OF CONTENTS

List of Tables

List of Figures

SECTION IX.C.7

MAINTENANCE PROVISIONS

IX.C.7.a. INTRODUCTION

The State of Utah is requesting federal redesignation of Salt Lake City from Carbon Monoxide nonattainment to attainment under Section 107(d) of the Clean Air Act of 1990 (hereafter referred to as the Act). In accordance with Section 175A of the Act, additions are made herein to the Carbon Monoxide State Implementation Plan (CO SIP) to demonstrate that Salt Lake City has achieved the National Ambient Air Quality Standard and can maintain the standard through the year 2006. These additions are hereafter referred to as the "Salt Lake City Carbon Monoxide Maintenance Plan" which contains the maintenance provisions of the CO SIP.

(1) Background

The federal Clean Air Act (CAA) requires areas failing to meet the federal ambient CO standard to develop State Implementation Plans (SIPs) with sufficient control requirements to expeditiously attain and maintain the standard. On March 3, 1978, the EPA designated the city of Salt Lake as a nonattainment area in accordance with the provisions of Section 107 of the Act based on measured exceedances of the eight-hour standard observed in the nonattainment area.

In response to new siting guidelines published by EPA, a CO monitoring site was established in Salt Lake City at 229 South State Street. The data collected at that site was used to determine the 12.1 ppm design value for Salt Lake City.

On November 15, 1990, Congress amended the Clean Air Act which resulted in new requirements for the CO SIP, as well as the designation of Salt Lake City to a nonattainment level based on monitoring data from 1988-1989. Because Salt Lake City had no violations of the CO standard during 1988-1989, it was designated as a "not classified" nonattainment area.

An eight-hour average and a one-hour average National Ambient Air Quality Standard (NAAQS) have been established for CO. By January 1, 1990, the State had adequate ambient CO monitoring data to demonstrate attainment of the NAAQS for CO in Salt Lake City. A CO saturation study was performed in January of 1993, resulting in the relocation of Salt Lake City's State Street monitor from 135 South State Street to 1400 South State Street. Salt Lake City has never measured an exceedence of the 35 ppm one hour average. On December 18, 1994, an exceedance of the 9 ppm eight-hour average CO standard was measured at this site. A 10 ppm CO measurement was recorded. This is the first exceedance measured near State Street since 1987. CO concentrations are typically higher during the months of January, November and December. The “CO season” in Salt Lake City begins in January of any given calendar year. The CO season is then interrupted by the summer months and continues to include November and December of that calender year. The current site at 1400 South State Street is representative of the original monitoring site for tracking future CO emissions.

(2) Maintenance Plan Overview

The Federal Clean Air Act, and EPA policy based on the Act, require that Maintenance Plans satisfy several prerequisites in order to be federally approvable. Federal approval of the Maintenance Plan is necessary in order to officially redesignate Salt Lake City as a carbon monoxide attainment area. Table IX.C.28 identifies the prerequisites that must be fulfilled before a maintenance plan can be approved. Table IX.C.29 identifies the requirements of a Maintenance Plan.

Table IX.C.28 Prerequisites to Redesignation

Category	Requirement	Reference	Addressed in Section
Existing Controls	The State must assure that control measures required in past CO SIP revisions have been implemented, and that existing controls will remain in effect after redesignation, unless it has demonstrated to EPA's satisfaction that the standard can be maintained without a specified control which the state may propose to delete.	CAA: Sec. 172(c)(1)	IX.C.7.b(1)
Existing Controls	Areas that were required to implement transportation control measures and/or inspection/maintenance programs must provide evidence that these programs have been fully implemented.	CAA: Sec. 187(a)(4) and Sec 182(a)(2)(B)	IX.C.7.b(2)
Existing Controls	The state must assure that acceptable provisions exist and are being implemented to provide for new source review.	CAA: Sec. 172(c)(5)	IX.C.7.b.(3)
Oxygenated Gasoline Program (Waivers for Salt Lake, Davis, and Weber Counties)	In a CO nonattainment area which is redesignated as attainment for CO, the requirements of this subsection shall remain in effect to the extent such program is necessary to maintain the standard thereafter in the area. Until such time an oxygenated fuels program is not required.	CAA: Sec. 211(m)(6)	IX.C.7.b(6)
CO Monitoring	Eight consecutive quarters of CO monitoring data must show that violations of the standard are no longer occurring.	CAA: Sec. 107(d)(3)(e)(I)	IX.C.7.c
Verification	Area and mobile source emission data must be examined for evidence of economic downturn that may have contributed to attainment, and if appropriate, the State must assure that recovery will not jeopardize continued maintenance of the standard.	Federal Reg. Vol 57 No. 74 13563	IX.C.7.d
Verification	The state must verify that the improvement in air quality is due to permanent and enforceable reductions in emissions.	CAA: Sec. 107(d)(3)(e)(iii)	IX.C.7.d(1)(a)

Table IX.C.29 Requirements of a Maintenance Plan			
Category	Requirement	Reference	Addressed in Section
Attainment Emission Inventory	The state can choose to demonstrate maintenance of the NAAQS using an emissions inventory approach. This approach requires the development of an "attainment emission inventory" to identify the level of emissions in the area which is sufficient to attain and maintain the standard.	Calcagni, September 4, 1992, Sec 187(a)(1) and Sec 172(c)(3)	IX.C.7.e
Projected Inventories	Projection inventories must be completed that show the standard can be maintained in the future (i.e., for 10 years after redesignation and 20 years for conformity), especially noting whether future increases in CO emissions are expected and can be accommodated without additional controls, or whether new controls need to be implemented to insure maintenance of the standard.	CAA: Sec. 172(c)(3) and Sec. 175(a)	IX.C.7.f; IX.C.7.g
New emission controls	The state must ensure that it has legal authority to implement and enforce all control measures for which emissions credits are assumed in the projection inventory demonstrating maintenance of attainment.	CAA: Sec. 110(a)(2)(B) and Calcagni memo Sept. 4, 1992	IX.C.7.g
Contingency Measures	Section 175A of the Act requires that areas seeking redesignation from nonattainment to attainment develop contingency measures that include state commitments to implement additional control measures in response to future violations of the NAAQS.	CAA: Sec. 175A and Calcagni memo Sept. 4, 1992	IX.C.7.h
Verification of Continued Maintenance	The maintenance plan must indicate how the state will track the progress of the Maintenance Plan.	CAA: Sec. 172(c)(3), Sec. 187(a)(1) and Sec 187(a)(5)	IX.C.7.i
Periodic Inventory	The CAA requires moderate CO nonattainment areas to submit a periodic inventory no later than September 30, 1995, and no later than the end of each 3 year period thereafter until the area is redesignated to attainment. This inventory must meet all requirements of the attainment inventory. Although the State is not required to submit this inventory for Salt Lake City, the State will use it to track the progress of the maintenance plan.	CAA: Sec. 187(a)(5) and Sec. 187(a)(1)	IX.C.7.i(1)

IX.C.7.b EXISTING RULES AND CONTROLS

Requirements Relating to Existing Controls and Regulations:

- *The State must assure that control measures required in past CO SIP revisions have been implemented and that existing reasonably available control technology (RACT) controls will remain in effect after redesignation, unless it has demonstrated to EPA's satisfaction that the standard can be maintained without one or more controls.*

- *Areas that were required to implement transportation control measures and/or inspection/maintenance programs must provide evidence that these programs have been fully implemented.*

- *The State must assure that acceptable provisions exist and are being implemented to provide for new source review.*

(1) Enforcement of Existing CO State Implementation Plan

This SIP revision incorporates federal requirements for demonstrating that the CO standard can be maintained in future years in the Salt Lake City nonattainment area. The State will continue to enforce the requirements of the existing CO SIP until the redesignation request is approved. The State also certifies that all existing controls required in past CO SIP revisions, and new controls incorporated in these revisions, will remain in effect after redesignation of the region to attainment, unless the State demonstrates to EPA's satisfaction that the standard can be maintained without a specific control which the State may propose to delete.

(2) Assurance That Existing CO and Transportation Control Measures Have Been Fully Implemented

The State certifies that, to the best of its knowledge, carbon monoxide sources covered by an area or mobile source control in the Salt Lake City nonattainment area are in compliance with state and federal law. All of the programs which were implemented before and during the 1990 base year inventory such as basic inspection and maintenance (I/M) are currently required for air quality purposes in the Salt Lake City nonattainment area. The basic I/M program, the Federal Motor Vehicle Emission Control Program and traffic control measures were included in past attainment demonstrations for CO SIP revisions. The State will assure that all of the programs implemented by the CO SIP, including the aforementioned control measures, will be maintained in future years in order to maintain the NAAQS.

(3) Permitting of Existing, New, or Modified Sources

R307-1-3 of the Utah Air Conservation Rules, Control of Installations, specifies state requirements for conducting preconstruction review of new sources and modifications to existing sources. The rule requires all new or modified sources with a potential to emit any type of air pollutant to submit a Notice of Intent to construct and to obtain a permit from the State, if necessary, before construction of the source may begin. The permit will require installation of best available control technology and in some cases dispersion modeling to assess impacts on the airshed. If a new point source were to submit a Notice of Intent to construct in Salt Lake City, the general requirements of R307-1-3 would apply as well as all existing and future nonattainment and maintenance area "new source review" sections within R307-1-3.3.

(4) Recent Controls That Contributed to Attainment After the CO SIP was Adopted

Salt Lake City has been in attainment of the NAAQS since before January 1, 1990. The last violation in Salt Lake City was in 1987. This improvement in air quality is the result of the CO SIP that was adopted in 1984 and additional federal emission control requirements. It is the position of the State that Salt Lake City did not exceed the CO standard during these years due to a combination of emission reductions resulting from 1) the implementation the Federal Motor Vehicle Control Program and 2) significant changes in the existing I/M program promulgated in 1991.

A major revision of Salt Lake County's I/M program was fully implemented prior to September 1, 1991. The revision was made in response to a 1990 legislative mandate that I/M counties use computerized analyzers, standardize their programs, and provide for reciprocity. Major improvements included: the use of BAR90 technology emissions analyzers; the inclusion of vehicles owned by federal agencies, federal employees, and university and college employees and students; an increased fail rate; the exclusive issuance of waivers by I/M technical center staff; a substantial increase in the dollar amount spent on emission-related repairs to qualify for a waiver ($100 for 1980 or older model cars, increased to $200 for 1981 and newer models; however, these figures vary somewhat among the counties); automated data management and audit functions; and coverage of more emission control devices by the Salt Lake County anti-tampering program. As a result of separate legislation, the number of vehicles qualifying for exemption from the I/M program because of "farm truck" classification has been reduced. Substantial emission reductions have resulted from these I/M program revisions. A significant increase in enforcement efforts is believed to have brought about reductions in mobile vehicle emissions. The CO reductions in Salt Lake City due to these revisions have contributed to attainment of the CO NAAQS. In 1993, the emission reductions due to revisions in the basic I/M program in Salt Lake City accounted for an additional emission reduction of approximately 3.5 tons/day of CO compared with the I/M program which existed prior to 1990, thereby helping Salt Lake City to attain, and maintain, the NAAQS for CO.

(5) State of Utah Waiver from the Oxygenated Gasoline Program

Salt Lake City is a “not classified” nonattainment area. The Clean Air Act does not require the implementation of an oxygenated fuels program in Salt Lake City prior to redesignation. However, Salt Lake City is in the same metropolitan statistical area as Ogden City which was classified a moderate non-attainment area at the time of the passage of the Clean Air Act Amendments of 1990. Based on this fact, an oxygenated fuels program would be required; however, the State is in the process of requesting redesignation of Ogden City to attainment. The applicability of an oxygenated fuels program to this area will be determined through the development of a maintenance plan for Ogden City.

IX.C.7.c. CARBON MONOXIDE MONITORING

Requirement Related to CO Monitoring:

- *Eight consecutive quarters of CO monitoring data must show that violations of the standard are no longer occurring. Because the CO standard allows for 1 measured exceedance per year, a violation of the standard is defined as 2 or more measured exceedances of the 9.0 ppm CO standard at the same monitoring site over a 1-year period.*

(1) CO Monitoring Network

Technical Support Document, Volume I, Tab 1

Information concerning CO monitoring in Utah is included in the Monitoring Network Review (MNR). Since the early 1980's, the MNR has been updated annually and submitted to EPA for approval. EPA personnel have concurred with the annual network reviews, and have agreed that the network remains adequate.

CO monitoring of the major urban area of Salt Lake City is complicated by the valley setting. EPA regulations for CO monitoring require that the peak monitoring stations be located adjacent to the most heavily traveled traffic corridors in the urban area. Stations located in neighborhood settings measure concentrations representative of continuous exposure to CO. Maximum CO concentrations occur during winter temperature inversions. The existing CO monitoring stations were sited in accordance with the EPA siting requirements. The peak sites were located based on traffic information obtained from the Utah Department of Transportation.

The annual emissions inventory indicates the amount of CO emissions from different sources in the Wasatch Front. Approximately eighty-five (85%) percent of the carbon monoxide emitted is generated by vehicles. Figure IX.C.19 illustrates the distribution of annual CO emissions in Salt Lake City for 1993. Figure IX.C.20 illustrates the distribution of daily CO emissions in Salt Lake City for 1993. The current CO monitoring network is designed primarily to monitor the impact from mobile sources. Figure IX.C.21 is a graph of the history of CO second-high 8-hour average concentrations that shows a comparison of the measured concentrations with the NAAQS.

When Utah's CO network was originally designed, no modeling data was available to assist in site location, and sites were chosen based on traffic volumes and patterns. Since that time, modeling has been completed for the Salt Lake City area. Figure IX.C.22 shows the results of the modeling. The model gives an estimate of the relative concentrations of CO, which indicates areas of expected maximum CO concentrations. The model verifies the original site selections, and indicates that the existing CO monitoring station is appropriately located.

From January 22 through 25, 1992, a carbon monoxide saturation study was performed in Salt Lake City. The emphasis of the study was to verify that the existing CO monitoring stations were located in areas representative of high CO concentrations.

The State Street Station #3. This micro-scale station is located at 1400 South State Street at one of the areas representative of highest CO concentrations identified by the CO saturation study. This monitor was installed on November 7, 1994. Site selection for this monitor began in 1993 but the work was delayed by the Ozone Maintenance Plan.

Figure IX.C.23 is a map of the existing Salt Lake City CO nonattainment area pinpointing the original monitoring stations. Figure IX.C.24 is a map pinpointing the current monitoring site. A site description inventory report from the AIRS data base is included in the Technical Support Document.

(2) Additional Monitoring

Bag Sampling

A trailer equipped with a battery-operated sequential bag sampler capable of collecting twelve one-hour integrated samples has been used at various locations in the Wasatch Front area to verify location of existing monitoring stations, to verify modeling results, and to measure CO concentrations in other areas of concern. This sampler has and will primarily be used during periods of high CO concentrations in the fall and winter months. Sampling has been performed within the Salt Lake City non-attainment area.

1992 Carbon Monoxide Saturation Study

The CO saturation study identified areas with elevated CO concentrations. The study was performed to verify that existing CO monitoring stations were located in areas representative of normal elevated concentrations. This saturation study resulted in the relocation of Salt Lake City's State Street monitor from 135 South State Street to the current location at 1400 South State Street.

(3) Ambient CO Monitoring Data

Each monitoring site is allowed one exceedance of the standard in a single year. Two or more exceedances in a single year is a violation. The entire CO planning area is considered to be in violation of the standard if a single monitor records more than one exceedance in a single year.

All of the monitoring data is contained in the Aerometric Information and Retrieval System (AIRS). A list of measured exceedances of the 9 ppm standard recorded in Salt Lake City during the years 1986 through 1994 is included in the associated technical support document.

Figure IX.C.25 visually documents the number of measured exceedances at the CO monitor in the Salt Lake City nonattainment area from 1970 through 1994.

(4) Exceedances of the CO Standard

In addition to recorded exceedances of the CO standard, EPA looks at the quantity of "missing" monitoring data in evaluating an area's CO attainment status. Missing data can occur when a monitor is being repaired, calibrated, or is malfunctioning, leaving a time gap in the monitored readings. EPA discounts these gaps if data capture for each calender quarter is more than 75 percent.

EPA allows one measured exceedance per calendar year, per monitoring site. For CO nonattainment areas, if the total data capture is less than 75 percent during a calendar quarter, the impact of the missing data on the attainment status of that area must be negotiated with EPA.

Salt Lake City had no measured exceedances in 1993, and only one in 1994. To determine whether the 75% data capture requirement for ambient monitoring was met, the State relied on the AIRS Data Completeness Report AMP 430 for 1993 and 1994. Monitored CO data for the 1993 and 1994 CO seasons support the State's redesignation request.

(5) Ongoing Review of Monitoring Sites

Even after redesignation of Salt Lake City to attainment for CO, the State commits to continue operating the existing CO monitoring site according to all applicable federal regulations and guidelines. The State will reevaluate the site location annually to determine whether new monitoring sites are needed or whether existing monitoring sites should be removed or relocated.

FIGURE IX.C.19

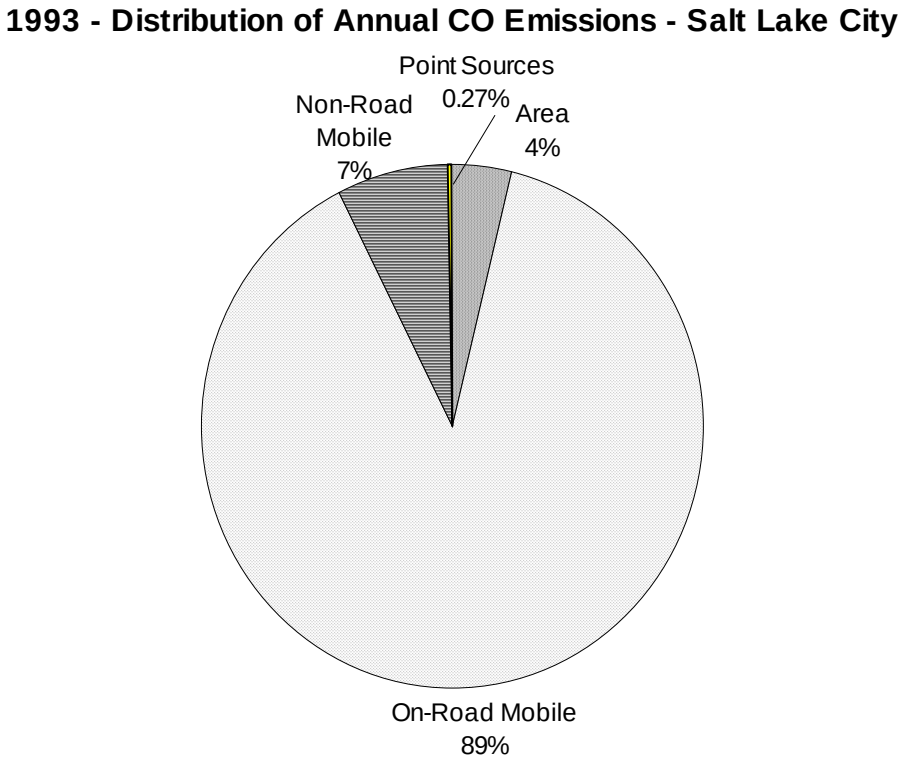


FIGURE IX.C.20

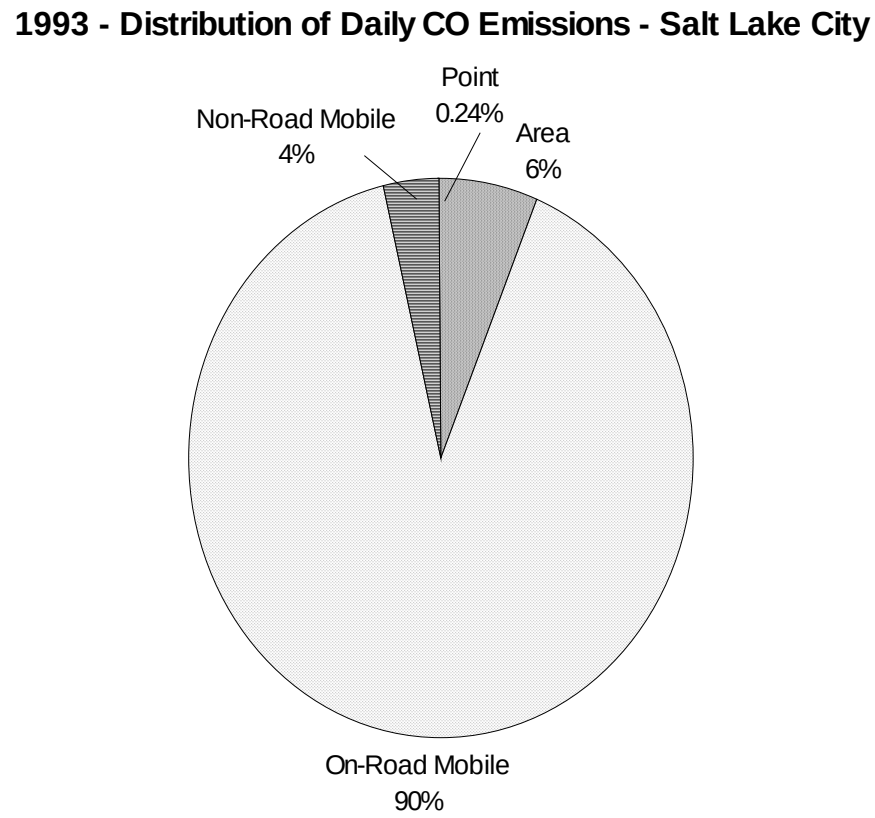


FIGURE IX.C.21

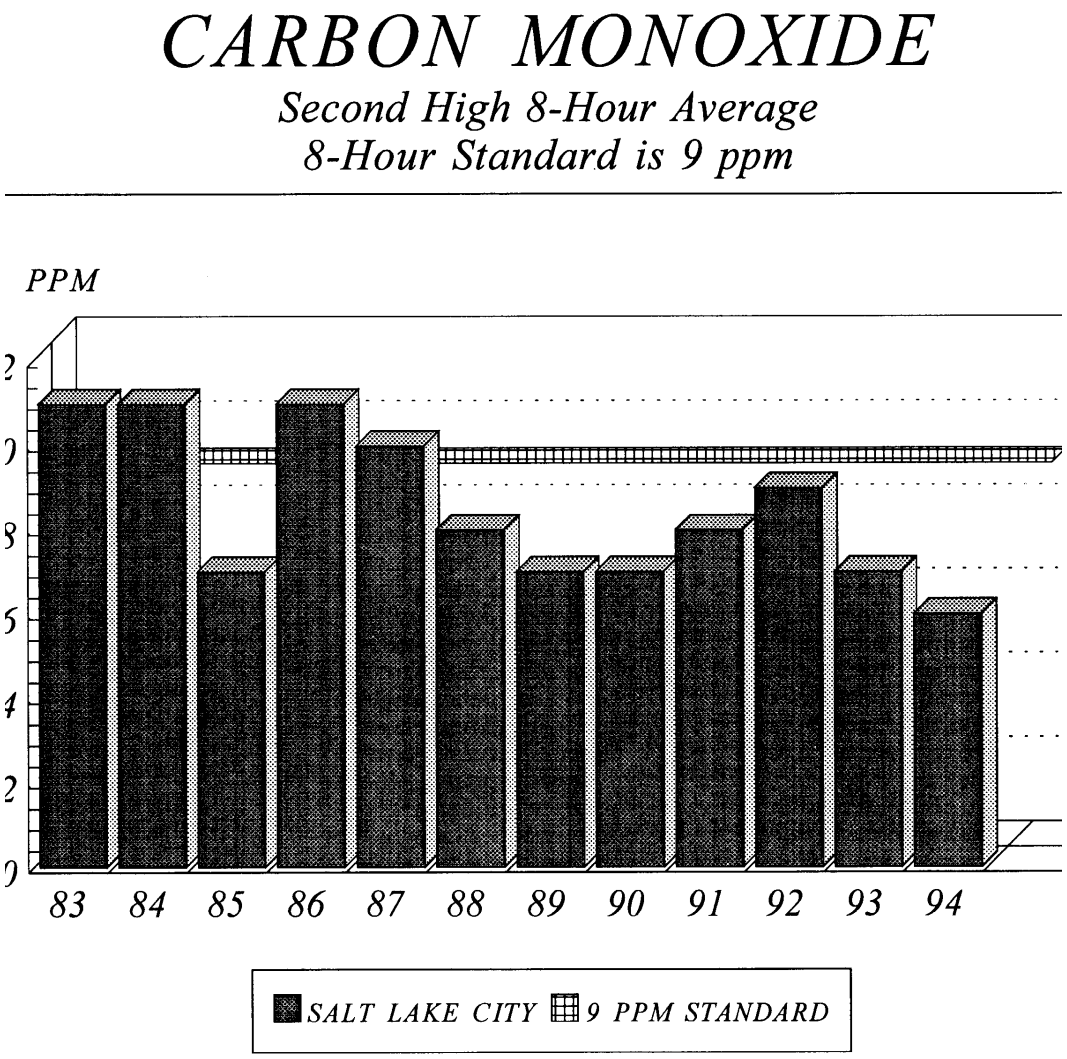


FIGURE IX.C.22 Map of modeling for site location

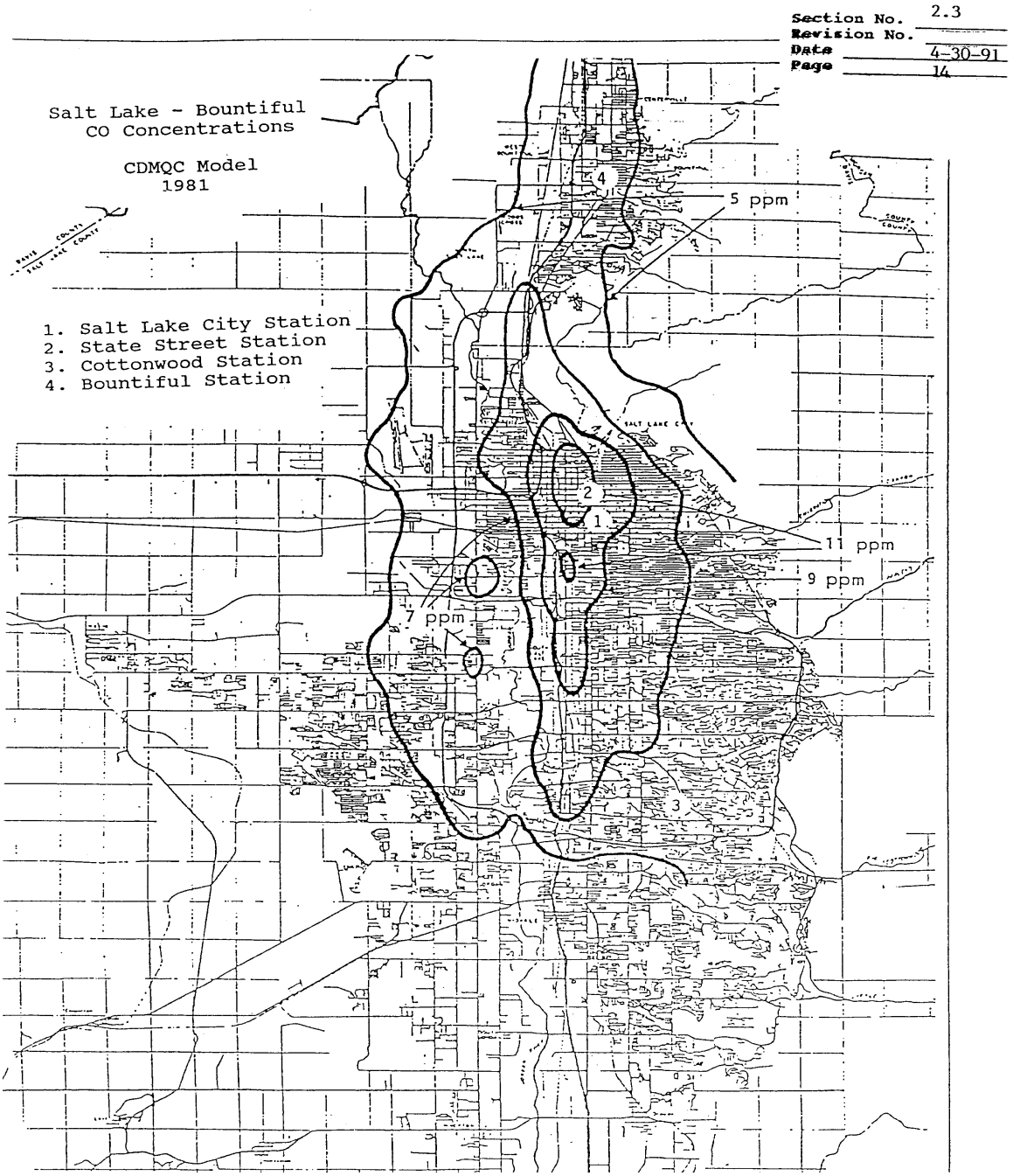


FIGURE IX.C.23

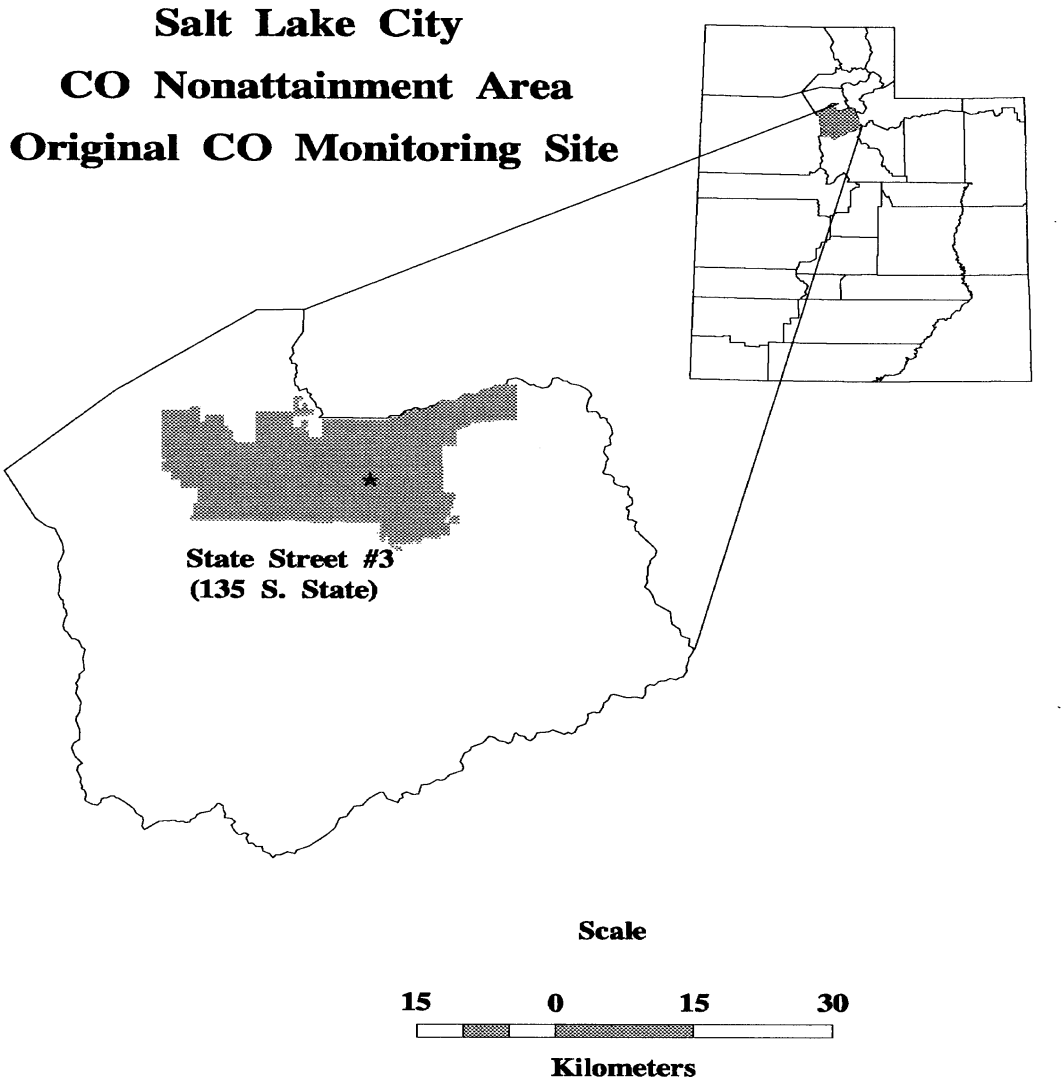


FIGURE IX.C.24

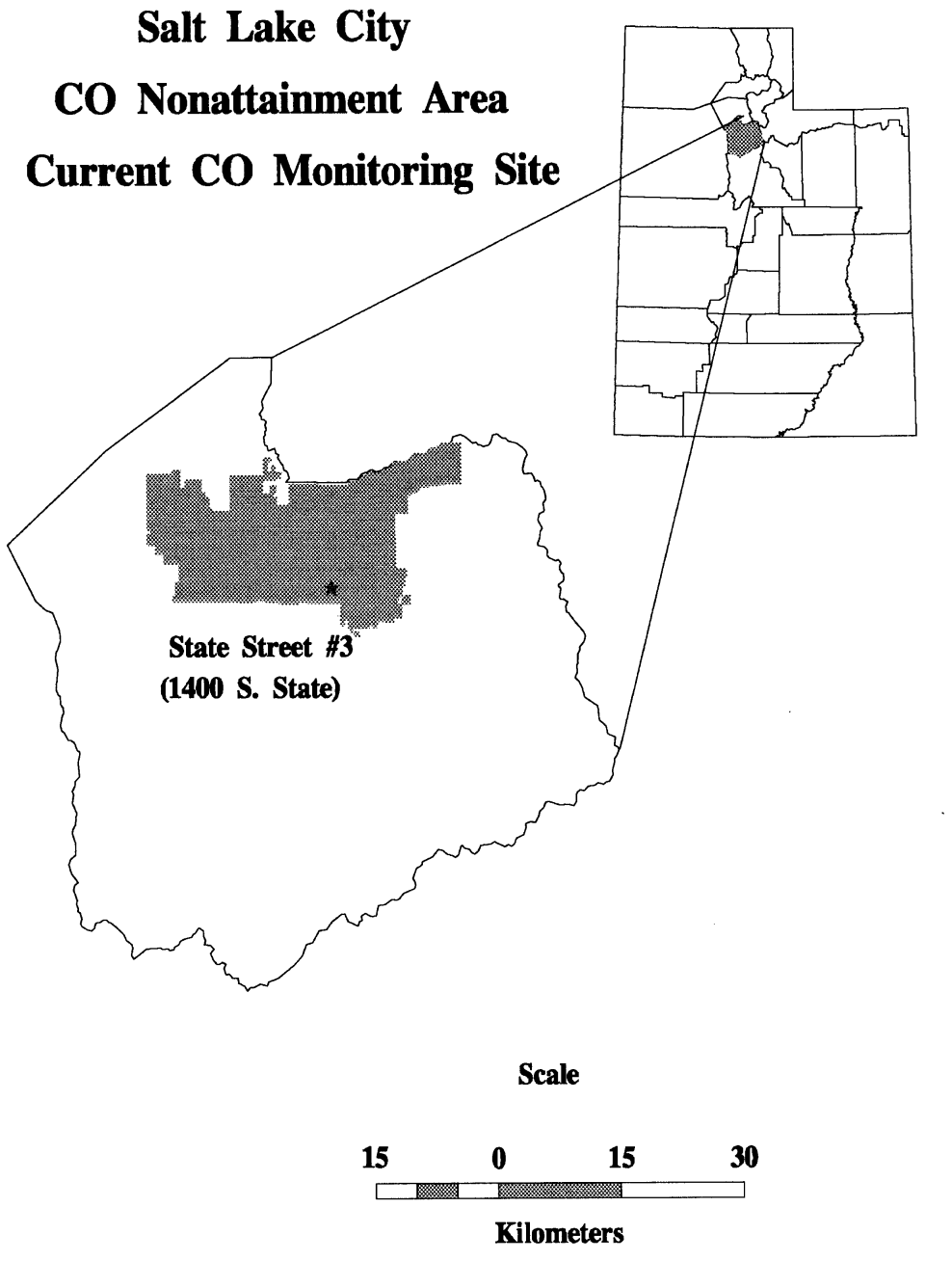
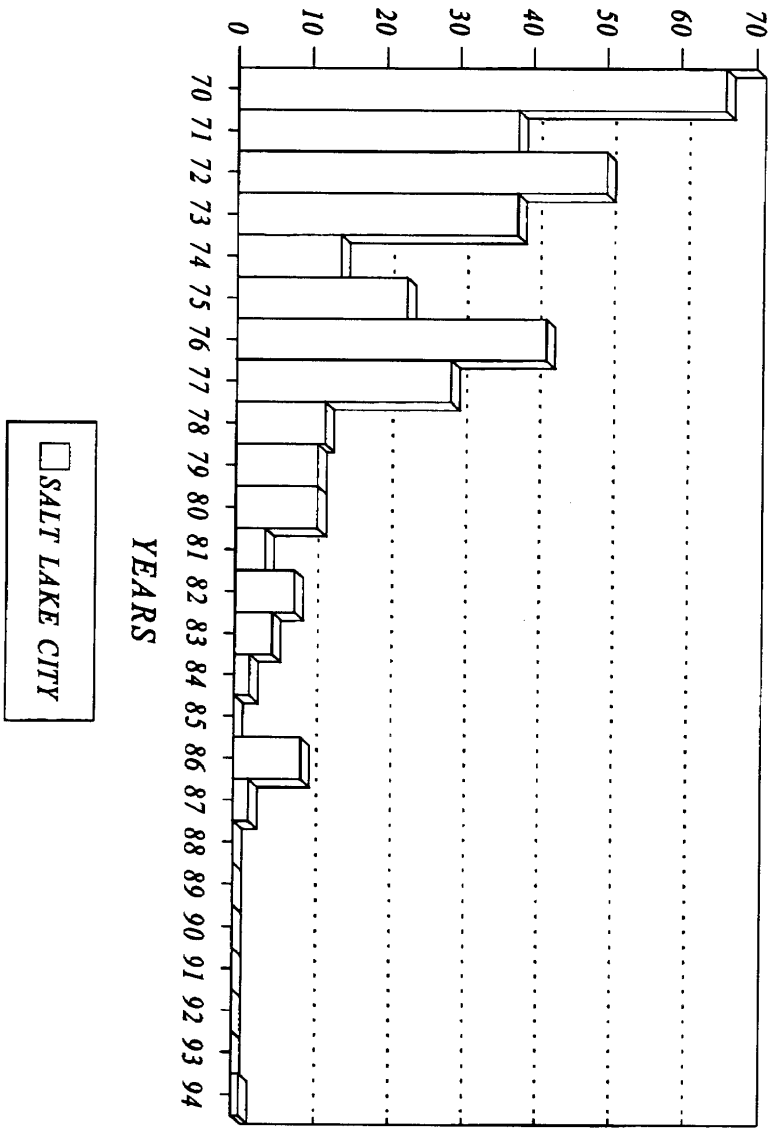


FIGURE IX.C.25



IX.C.7.d VERIFICATION OF AIR QUALITY IMPROVEMENTS

Requirements Related to Verification of Air Quality Improvements:

- *The state must verify that the improvement in air quality is due to permanent and enforceable reductions in emissions.*

- *Area and mobile source emission data must be examined for evidence of economic downturn that may have contributed to attainment, and if appropriate, the State must assure that recovery from the downturn will not jeopardize continued maintenance of the standard*

(1) Demonstration that Air Quality Improvements Are Permanent and Enforceable

(a) Enforceable Emission Reductions

The improvement in air quality already achieved in Salt Lake City has resulted from implementation of the emission controls listed below. Because these controls have been federally approved, the resulting CO emission reductions are federally enforceable. This plan includes a state commitment to continue to enforce all applicable requirements of past revisions to the State Implementation Plan, even after the Salt Lake City area is redesignated to attainment. This commitment, detailed in Section IX.C.4, makes permanent the emission reductions achieved from these requirements. The emission impacts of the controls listed below have been accounted for in completing the CO emission inventories for these maintenance provisions to the SIP.

1) The Federal Motor Vehicle Emission Control Program.
2) Basic I/M Program with improvements.

Items 1 and 2 above have been implemented in Salt Lake City and are discussed in greater detail in Section IX.C.4.

A continued improvement in air quality through the year 2006 for Salt Lake City will result from the following federal emission controls which have been promulgated, or may be implemented as a result of the requirements of the 1990 Clean Air Act Amendments. These federal control requirements will produce CO emission reductions that are permanent and federally enforceable.

1) Continuation of the Federal Motor Vehicle Emission Control Program

2) Continuing enforcement of basic I/M with improvements.

(b) Meteorology and Ambient Concentration

Technical Support Document, Volume I, Tab 2

For redesignation of the Salt Lake City CO nonattainment area to attainment, it is necessary to show that reductions in ambient CO concentrations are the result of permanently enforceable emissions reductions, and not the result of yearly variations in meteorological conditions. This section will illustrate that the air pollution potential for Salt Lake City continues to exist due to the ongoing presence of stagnation periods (inversions) prevalent in the area. For reference, 'violation' years and 'non-violation' years for CO in Salt Lake City are as follows:

Violation Years - Salt Lake City - 1986, 1987

Non-violationYears - Salt Lake City - 1985, 1988 through 1994

The air-pollution potential of an area is directly related to two variables; 1) the vertical diffusion of pollutants (the mixing depth), and 2) the wind speed in this mixing depth which results in horizontal transport of pollutants. To quantitatively assess these variables in Utah valleys and mountains, an Air Stagnation Index (ASI) has been developed. These are numerical, non-dimensional values ranging from less than 50 in the worst stagnant conditions to more than 1000 during the least stagnant conditions. The ASI is calculated as follows:

ASI = Surface Wind (knots) x Mixing Height (feet) / 100

In Utah, the worst stagnation occurs for prolonged periods with stationary high pressure, both at the surface and aloft, mainly during the months of November through March. Cold air trapped in valleys, combined with low sun angle and snow cover, result in strong surface inversions. Warm air advection associated with the high pressure aloft strengthens the stable conditions at the surface. This stable layer is generally confined to below 6,000 feet above sea level. The depth of the Salt Lake valley averages around 5000 feet, with the valley floor at about 4500 ft above sea level, and the top of the Wasatch and Oquirrh Mountains at about 9500 ft ASL. Under these conditions, diurnal heating cannot break up the stable layer. As a result, pollutants are trapped in the shallow mixing depth at the surface, unable to mix with clean air above.

Surface winds, largely controlled by local topography rather than pressure gradients, are very light, and often show a diurnal reversal (mid-day shift in wind direction) limiting any horizontal transport which would result in air cleansing. At the same time, elevations above 6500 ft often have good ventilation due to warm advection, resulting in mild temperatures and deep mixing depths. Valley ASIs frequently drop below 150, while ASIs at higher elevations may be 600 or greater.

Radiosonde data of the vertical structure of winds, temperature, and humidity are the primary source of specific data used in determining ASIs for Salt Lake City. Radiosondes are released twice daily by the National Weather Service (NWS) located at the Salt Lake City International Airport, which is located in the nonattainment areas. Actual daily ASI values recorded by the NWS at the Salt Lake City Airport for the period January 1985 through March 1995 can be found in the Technical Support Document.

As shown in Table IX.C.30 below, violations of the 8-hour NAAQS for CO occur during high or moderate stagnation periods with very low ASIs (100 or less). Only one exceedance occurred during a period of weak stagnation (ASI = 101-150). Surface temperatures associated with these periods are within the normal range of winter day-time highs and night-time lows. The values contained in this table were taken from NWS data collected at the Salt Lake City airport and UDAQ monitoring records. They indicate the date, time, location, monitored concentration, actual ASI, and the average 8-hour wind speed and temperature during CO exceedances recorded in Salt Lake City for the time period November 1985 through March 1995.

TABLE IX.C.30 Monitored Carbon Monoxide Violations (8-hr avg.) and Air Stagnation Indexes for Salt Lake City from 1985 through 1994.

Monitor Site	High	Date	Hour	Monitored Conc. (ppm)	Actual ASI	Wind Sp. (m/s)	Temp. EF[a]
1985 - None							
1986							
State St. #2	1st	12/15/86	1300	12.4	48	2.3	25
	2nd	12/19/86	1300	11.6	45	2.5	29
1987							
State St. #2	1st	02/09/87	1300	10.1	110	2.2	33
	2nd	01/26/87	2300	9.8	90	2.7	41
1988 Through 1994 - None							

a - Data recorded by NWS

Table IX.C.31 indicates the number of days with ASIs equal to or below 150 for violation and non-violation years during the period 1985 through 1995. A yearly breakdown of this table appears in the Technical Support Documentation (TSD).

Three inversion episodes during 1991, 1992, and 1993 (non-violation years) were reviewed for similarity with the four exceedance episodes which occurred during 1986 and 1987 (see Table IX.C.30). Monitors in Salt Lake City recorded CO concentrations and wind speed data for the following inversion episodes:

February 1 through February 8, 1991
January 25 through January 30, 1992
January 14 through January 16, 1993

Monitored CO concentrations, wind speed, and ASI values for these periods appear in the TSD. Using the daily ASI value and the 8-hour average wind speed, the average mixing height can be expressed as:

Mixing Height (feet) = ASI x 100 / 8-hour Average Wind Speed (knots).

Accordingly, the average mixing height during the four exceedance periods listed in Table IX.C.30 above ranged from approximately 370 ft with an ASI equal to 10, to 2022 ft with an ASI equal to 100 (see TSD). The length, height and orientation of the of the Wasatch Mountains combine to force the natural eastward flow of air into north and south flow patterns. Cold, trapped air and pollutants are forced against the east range, unable to lift the additional 3000 feet or more that is required to move this air into the predominantly eastwardly wind-flow field aloft.

Using the average daily ASI and average wind speed from the 1991, 1992, and 1993 inversion episodes, the average mixing heights during these periods were 525, 1020, and 531 feet, respectively. Daily mixing layer depths during the 1991 episode varied from 152 ft up to 940 ft, depending on the daily ASI and the location of the wind speed monitor. Mixing layer depths during the 1992 episode varied from 551 feet up to 2345 feet. Mixing layer depths during the 1993 episode varied from 138 feet up to 985 feet. Since the ASI values are calculated from afternoon radiosonde data, it can be reasonably assumed that these values closely represent the maximum mixing height for the day. Other hours of the day would experience mixing heights less than those listed above.

TABLE IX.C.31 Number of Periods with ASI Values less than 150 During Violation and Non-violation Years

Level of Stagnation	Total # of Days During Violation Years	Average # of Days During Violation Years	Total # of Days During Non-violation Years	Average # of Days During Non-violation Years
Salt Lake City - 1986 and 1987)				
Strong (ASI = 0-50)	42	21	123	15
Moderate (ASI = 51-100)	49	24	195	24
Weak (ASI = 101-150)	30	15	117	15

Inversion episode wind data for each period does not indicate any prolonged periods of high wind speed (> 10 meters per second) required to significantly mix the stagnated air. Monitored 8-hour CO concentrations do appear to fall off slightly (down to the 1-3 ppm range) during short periods where wind speeds average 7 to 8 meters per second. However, the 8-hour average concentrations quickly return to the 3-6 ppm range after these winds subside. The monitored 8-hour CO concentrations during the 1991 inversion episode were in the 2 to 6 ppm range an average of 92% of the time, with the highest reported 8-hour concentration being 6.5 ppm for Salt Lake City. The monitored 8-hour CO concentrations during the 1992 inversion episode were in the 2 to 6 ppm range an average of 90% of the time, with the highest reported 8-hour concentration being 7.8 ppm for Salt Lake City. The monitored 8-hour CO concentrations during the 1993 inversion episode were in the 2 to 6 ppm range an average of 73% of the time, with the highest reported 8-hour concentration being 7.0 ppm for Salt Lake City.

The average wind speed during the 1991, 1992, and 1993 inversion episodes were 2.7, 2.6, and 3.5 m/s, respectively. The 8-hour average wind speeds during these same episode periods were as low as 0.4 m/s, and as high as 6.7 m/s. The average wind speed during the four CO exceedance episodes ranged from 1.2 to 2.7 m/s. A time-weighted percentage of monitored wind speeds for the three inversion periods appears in the Technical Support Document.

After careful review of the meteorology in Salt Lake City during the past 10 years, it has been concluded that this area continues to experience wintertime inversion periods. These periods are equal in severity and frequency to that which occurred during 1986 and 1987. However, no violations of the CO standard have occurred. Similar low mixing heights, low wind speeds, and temperatures observed during each exceedance period occurred during the three episode periods in 1991 - 1993. The State therefore suggests that meteorological variables did not significantly influence the reduction in ambient CO concentrations in Salt Lake City. This position is further substantiated by information and analyses contained in the Technical Suport Document.

(2) Assurance that Baseline Point Source Emission Data Have Not been Influenced by Temporary Economic Downturn

The State of Utah Governor's Office of Planning and Budget has verified that Salt Lake City has not experienced an economic downturn during the 1990s. In fact, analyses have shown that Salt Lake City has been experiencing robust economic growth during the 1990s.

IX.C.7.e. ATTAINMENT EMISSION INVENTORY - 1993

Requirements relating to Attainment Emission Inventory:

- *The state can choose to demonstrate maintenance of the NAAQS using an emissions inventory approach. This approach requires the development of an "attainment emission inventory" to identify the level of emissions in the area which is sufficient to attain and maintain the standard.*

- *The attainment emission inventory should be consistent with EPA guidance, and should include emissions during the time period associated with the monitoring data showing attainment.*

The 1993 attainment emissions inventory was prepared using the methodology that had been used for the 1990 base year inventory. The emissions inventory is divided into three major sections: point sources, area sources, and mobile sources. A discussion of each of these three sections follows. Summary tables showing peak CO daily emissions in tons/day for Salt Lake City is included as Table IX.C.32.

(1) Point Source Emissions Inventory

Technical Support Document, Volume II, Tab 7

Point source estimates of CO emissions were based on questionnaires sent to sources subject to the Operating Permit Program. The method shown on page 27 of the Inventory Preparation Plan (Utah Division of Air Quality, March 1992) was used to calculate wintertime daily emissions of CO. This method involves converting annual emission rates to a daily rate by using a source's operating schedule. An example of such calculations can be found in the 1993 attainment emission inventory Technical Support Document.

Estimates of CO were calculated for Amoco Oil Company and PacifiCorp Gadsby in Salt Lake City for the attainment year 1993. The 1993 CO emissions for these two sources were not greater than 100 tons, as specified by EPA guidance. However, projected year emissions are estimated to exceed 100 tons/year, as documented in both the Salt Lake City CO Maintenance Plan TSD and the Ozone Maintenance Plan TSD. Therefore, Amoco Oil Company and PacifiCorp Gadsby were both included in the attainment year inventory to maintain consistency between the CO attainment year and projected inventory, and the Ozone projected inventory. All other stationary sources with 1993 emissions less than 100 ton/year of CO were considered as part of the area source portion of the inventory for Salt Lake City.

The 1993 point source emission estimates reflect control measures that are already implemented. No rule effectiveness was used in the point source inventory due to the absence of any controlling state CO rules. Rule effectiveness is a measure of the ability of the regulatory program to achieve all of the emission reductions possible by full compliance with applicable rules at all covered sources, at all times. It reflects the assumption that rules are not typically 100 percent effective at all times. In the future, if rules are developed and become applicable, the State will conduct rule effectiveness studies to verify the compliance rate in Utah for various rules as resources allow, and will change the emissions inventory to reflect the results of those studies.

(2) Area Sources

Technical Support Document, Volume II, Tab 5

The area source inventory accounts for CO emissions at all stationary source locations emitting 100 tons per year or less within Salt Lake City. All emission estimates in the area source inventory were reported in *tons per peak CO season day* to reflect conditions most typical of higher CO concentrations.

In compliance with EPA guidance, emission estimates for area sources covered by existing rules were adjusted to reflect a rule effectiveness factor no greater than 80%.

(3) Mobile Sources Emissions Inventory

Technical Support Document, Volume II, Tab 6

Mobile sources are divided into two categories: on-road and non-road sources. Emissions from on-road mobile sources include all CO from automobiles, light-duty and heavy-duty trucks, and motorcycles designed for travel on established federal, state, or local roads. Calculated emissions from these vehicles are in the form of tailpipe exhaust. Rule effectiveness factors for on-road mobile sources are built-in to the MOBILE5A files and are reflected as settings within the body of the MOBILE5A input files.

Salt Lake City 1993 CO Inventory		CO Emissions	
			Tons/
Area Sources		Tons/Yr	CO Day
	Orchard Heaters	n/d	n/d
	Woodburning/ Fireplaces	2,175.49	13.58
	Coal - Residential	15.85	0.07
	Coal - Commercial	1.76	0.01
Stationary	Coal - Industrial	67.04	0.28
External	Nat'l Gas - Residential	106.42	0.38
Combustion	Nat'l Gas - Commercial	2.21	0.01
	Nat'l Gas - Industrial	pt/s	pt/s
	Fuel Oil - Residential	1.41	0.01
	Fuel Oil - Commercial	1.95	0.01
	Fuel Oil - Industrial	12.74	0.05
Incineration		74.61	0.20
Forest Fires		0.00	n/d
Firefighting Training		neg.	neg.
Structural Fires		0.20	0.00
Prescribed/Slash/Agricultural Burning		0.00	n/d
Open Burning		n/d	n/d
Detonation		n/d	n/d
Aircraft/Rocket Engine Firing & Testing		22.81	0.06
Charcoal Grilling		n/i	n/i
	Total Area Sources	*2,482.51*	*14.65*
Mobile Sources			
On-Road Mobile		57,476.17	202.24
Non-Road	Aircraft	2,281.41	6.21
Mobile	Railroad Locomotives	67.32	0.18
Class	Miscellaneous Non-road Equipment	2,256.08	1.90
	Total Non-Road Mobile	*4,604.81*	*8.29*
Point Sources		175.52	0.55
Note:	**Total Salt Lake City Emissions**	**64,739.01**	**225.73**
Numbers may vary slightly from report due to rounding.			
Numbers may not add due to rounding.			
n/ d = negative declaration			
n/ i = no information currently available			
neg. = negligible amount			
pt/ s = reported as point source			

TABLE IX.C.32

Emissions from non-road mobile sources include tailpipe exhaust and evaporation from the engine and fuel systems during the operation of trains, aircraft, recreational, construction, lawn and garden, and any other portable petroleum-fueled equipment.

(a) On-Road Emissions

The on-road emissions inventory was generated by combining CO emission factors with estimates of average annual and winter weekday vehicle miles of travel (VMT) within Salt Lake City. All emission estimates in the mobile source inventory were reported in tons of pollutant per peak carbon monoxide season day, per average day, and per average year.

The emission factors were derived from the EPA's mobile sources computer model, MOBILE5A, which provides emission factors for active and passive aspects of vehicle ownership including engine block cooling and tailpipe exhaust. MOBILE5A incorporates the current federal tailpipe standards as well as those required in the Act, and allows users to input local parameters for vehicle control programs already in place or planned for the future. All Mobile5a parameters involving inspection and maintenance (I/M) and the anti-tampering program (ATP) were measured, estimated, or confirmed by the Salt Lake City-County Health Department, which oversees these programs in Salt Lake City.

In August 1994, Utah Department of Transportation (UDOT) staff issued a report entitled *1993 VMT by County, City and Functional Class*. This summary report, which tabulates actual VMT in average annual daily traffic, uses the Highway Performance Monitoring System (HPMS) database and itemizes VMTs occurring on each of 12 functional roadway classes in each city and county within the state. In order to be consistent with Wasatch Front Regional Council's roadway classes (utilized later in the Projections Inventory) which are based on lane number rather than functional use, UDOT's twelve classes were summarized and reassigned into three classes: freeway, arterial & collector, and local roads. The annual average daily VMTs were adjusted to typical winter weekday VMTs using conversion factors provided by WFRC. The conversion factors and methods are explained in the Technical Support Documentation for on-road mobile sources.

Since the HPMS model does not attempt to estimate vehicle speeds, the WFRC supplied vehicle speed estimates for 1993 using recent population, employment, travel, and congestion measurements and projections.

The following inventory Tables IX.C.33 and IX.C.34 present the on-road mobile emissions portion of the 1993 CO Attainment Inventory for both a typical winter weekday and an average annual day. The attainment level of 202.24 tons/winter weekday CO is shown.

TABLES IX.C.33 and IX.C.34

SALT LAKE CITY: On-Road Mobile Carbon Monoxide Emissions during a 1993 Winter Weekday Day (WWdy).
June 12, 1995 edition

Calendar Year	ROAD TYPE	Year round Average Weekday Vehicle Miles Traveled	Winter Weekday Vehicle Miles Traveled	Daily Free Flow Fraction	Daily Congested Traffic Fraction	Free Flow Speed miles/hour	Free Flow CO rams/vehicle mile travele	Congested Traffic Speed (miles/hour)	Congested Traffic CO rams/vehicle mile travele	ALL DAY CO tons/winter weekday
1993	Freeway	1,676,230	1,642,706	0.813	0.187	46.80	26.90	40.80	28.70	49.28
1993	Arterial & Collector	2,591,338	2,539,511	0.813	0.187	30.30	35.31	16.10	57.52	110.37
1993	Local	810,439	794,230	0.813	0.187	20.00	48.69	20.00	48.69	42.59
1993	**SUM**	**5,078,007**	**4,976,447**							**202.24**

SALT LAKE CITY: Annual On-Road Mobile Carbon Monoxide Emissions during Calendar Year 1993.
June 12, 1995 edition

Calendar Year	ROAD TYPE	Year round Average Weekday Vehicle Miles Traveled	Yr-rd Avg Day Vehicle Miles Traveled	Daily Free Flow Fraction	Daily Congested Traffic Fraction	Free Flow Speed miles/hour	Free Flow CO rams/vehicle mile travele	Congested Traffic Speed (miles/hour)	Congested Traffic CO rams/vehicle mile travele	Average Day CO tons/day	ALL YR CO tons/year
1993	Freeway	1,676,230	1,544,201	0.813	0.187	46.80	22.39	40.80	23.83	38.54	14,065.56
1993	Arterial & Collector	2,591,338	2,387,230	0.813	0.187	30.30	29.22	16.10	47.59	85.85	31,336.72
1993	Local	810,439	746,604	0.813	0.187	20.00	40.23	20.00	40.23	33.08	12,073.89
1993	**SUM**	**5,078,007**	**4,678,035**							**157.47**	**57,476.17**

(b) Non-Road Emissions

Emissions from non-road mobile sources include releases from trains, airplanes, recreational, construction, yard care and snow removal, and any other non-road petroleum-fueled vehicle or equipment.

(i) Trains

The two railroad companies operating within Salt Lake City submitted reports of their 1993 train activities. Line-haul activity was reported in terms of fuel usage and yard activity was reported in terms of number of yard trains. These data were combined with emission factors published in EPA's "Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources" (EPA-450/4-81-026d revised) to estimate peak CO winter day emissions.

(ii) Aircraft

The Wasatch Front Regional Council (WFRC) studied and summarized the flight activity at the Salt Lake City International, the only airport in Salt Lake City. Their report presented landing and take off (LTO) statistics. To further refine commercial aircraft emissions the Airport Activity Statistics of Certificated Route Air Carriers (AAS)(ADA 229303) provided an itemized list of aircraft makes/models and the LTOs attributed to each. With the assistance of the EPA's FAEED software package, CO emissions per LTO were calculated. The results were summed to produce peak CO winter day emissions.

(iii) Other Non-Road Engines

This section includes the emissions from non-road engines other than aircraft and trains.
It covers equipment and vehicles used for winter recreation, construction, snow removal, airport service, and other miscellaneous non-road engines and vehicles.

Energy and Environmental Analysis Inc. (EEA) studied the 1990 pollution burden from non-road engines in 33 nonattainment areas nationwide. EEA accessed commercial and public records in several of these nonattainment areas to compile an inventory entitled "Inventory A." A second EEA inventory accessed confidential industry-supplied records to generate an inventory entitled "Inventory B." Overall, there was reasonably close correlation between these two inventory approaches. Uncertain which of the two inventories, A or B, was the most accurate, the results were averaged to produce a third inventory entitled "A+B/2".

Salt Lake City was not among the areas studied by EEA, but Utah's Provo-Orem area was studied by EEA. Provo-Orem's emission factors were projected on Salt Lake City. The 1990 human population of each city provided the ratio to produce 1990 winter day emissions in Salt Lake City. Local trends in population were provided by the Utah State Office Of Planning and Budget.

IX.C.7.f FUTURE AIR QUALITY PROJECTIONS

(1) Projected Emission Inventory, 1994 - 2006

Requirement Relating to Projected Inventories:

> - *Projection inventories must be completed that show the standard can be maintained in the future (i.e., for ten years after redesignation), especially noting whether future increases in CO emissions are expected and can be accommodated without additional controls, or whether new controls need to be implemented to insure maintenance of the standard.*

The attainment emission inventory reported above in Section IX.C.7.e documents a level of emissions in Salt Lake City which is sufficient to maintain the National Ambient Air Quality Standards for CO. Emissions projections for each source category are used to determine if expected emission levels in future years will exceed the 1993 attainment emission inventory level. Maintenance of the NAAQS is demonstrated if the projected emissions remain below the 1993 level.

The projection emissions inventory is divided into three major sections: point sources, area sources, and mobile sources. A discussion of how emissions were projected for each of these three sections follows. Figure IX.C.26 graphically demonstrates that the emission inventory remains below the 1993 level through the year 2006. A summary table showing peak CO season daily emissions in tons/day is included as Table IX.C.35.

(a) Point Sources

Technical Support Document, Volume III, Tab 7

EPA guidance establishes accepted methods of projecting emissions from point sources. EPA-452/R93-002, "Guidance for Growth Factors, Projections, and Control Strategies for the 15 Percent Rate-of-Progress Plan," outlines criteria for the use of actual and allowable emissions in projected inventories. Actual emissions from a source are the emissions reported based on actual operating hours, production rates, and control equipment for the processes carried out at the source. The 1993 attainment emissions inventory is based on actual emissions. Allowable emissions are based on the regulatory element of the source's operating permit, or approval order, which represents a regulatory limit on emissions from the source.

When allowable emissions are used in projection inventories, the guidance document cited above recommends that an allowable emission limit be calculated for the source based on the regulatory emission limit multiplied by an expected level of activity. It is important to note that allowable projections are not full allowable emissions; i.e., allowable emissions are the allowable emissions limit multiplied by the maximum theoretical activity level.

Both actual and allowable emissions have been used in this Maintenance Plan's projected inventories. The activities at Amoco Oil and PacifiCorp Gadsby were evaluated to determine whether actual or allowable emissions, or some combination of the two, should be used. Evidence of those evaluations is provided in the Technical Support Documentation in the form of letters submitted to the State by sources as part of the Ozone Maintenance Plan, which affects the projections included in the CO Maintenance Plan. As a result, Amoco Oil is projected to operate at 100% of capacity from 1994 through 2006. PacifiCorp Gadsby is

projected to operate at 43% of capacity in 1994 and 85% of capacity in 1995. An employment growth factor from the State of Utah Economic & Demographic Projections is incorporated from 1996 until 2006.

The projected CO emissions are demonstrated to remain below the 1993 attainment year emissions level. The 1993 attainment year and projection year peak CO season daily emissions for individual point sources are summarized in Table 36 . The point source attainment year inventory contains a listing of emissions by individual sources that comprise each plant's actual emissions.

(b) Area Sources

Technical Support Document, Volume III, tab 5

Growth factors for estimating projection year emissions were based on population and industrial employment growth derived from the Office of Planning and Budget's *State of Utah Economic & Demographic Projections 1994* in conformance with EPA guidance on preparing area source inventories for CO planning.

(c) Mobile Sources

Technical Support Document, Volume III, Tab 6

(i) On-Road Emissions

The on-road projected emissions were generated by combining CO emission factors with estimates of average annual and winter weekday vehicle miles of travel (VMT) within Salt Lake City. All emission estimates in the mobile source inventory were reported in tons of pollutant per peak CO season day, per average day, and per average year.

The emission factors were derived from the EPA's mobile sources computer model, MOBILE5A, which provides emission factors for active and passive aspects of vehicle ownership including engine block cooling and tailpipe exhaust. MOBILE5A incorporates the current federal tailpipe standards as well as those required in the Act, and allows users to input local parameters for vehicle control programs already in place or planned for the future. In the absence of knowing the actual post-1995 vehicle I/M program to be implemented, Salt Lake County’s Basic I/M program currently in use is reflected in the inventory as a minimum target. The details surrounding the final I/M program will be made by the Salt Lake City-County Health Department.

The Wasatch Front Regional Council is the officially-recognized metropolitan planning organization covering the Salt Lake City nonattainment area, and the preferred source for estimating future VMT and speeds. The WFRC provided estimates for 1990, 1995, 1996, and 2005, using a full array of local activity conditions including their knowledge of current and upcoming roadway improvement projects, land-use planning policies, historic vehicle movement data, population and employment distributions, and other demographic statistics. The VMT and speed estimates were furnished within the context of two future scenarios: the “build” and “no-build” options of WFRC’s adopted Long Range Transportation Plan.

As noted in the Attainment Inventory section above (IX.C.7.e), UDOT staff tabulated and reported actual 1993 VMT in August 1994 using the HPMS database. With the benefit of this new information, the WFRC's projected 1993 VMT was replaced with HPMS's actual 1993 VMT, adjusted to average weekday

traffic, in the emissions inventory. Then, in consultation with WFRC staff, the MPO's estimated VMT for 2005 and 2015 “no-build” scenario was retained, while using straight-line interpolation to obtain VMT estimates for the intervening years. The "no-build" option projects higher vehicle emissions between 1993 and 2006 than the "build" option shows. The purpose of the "build" option is to add capacity to major roadways, and thus to reduce the expected decline in vehicle speeds. Therefore, the "no-build" option is more conservative in projecting future vehicle emissions. The conversion factors and estimation methods are explained in the Technical Support Documentation for on-road mobile sources.

Again, since the HPMS does not attempt to estimate vehicle speeds, the WFRC's vehicle speeds for all years 1993 through 2006 were also retained.

Finally, it is important to note that CO emissions from mobile sources decline between 1993 and 2006 in spite of increasing population and increasing VMT. There are two provisions in the 1990 Clean Air Act which allow this to happen. The first is that vehicles are required to emit less CO, a provision which is phased in during model years 1994 through 1996. Second, restrictions to reduce emissions during cold starts (aproximately 20 degrees Fahrenheit) also are phased in during model years 1994 through 1996. These provisions reduce CO emissions far into the future, as newer vehicles replace older ones. Both these factors are built into the MOBILE5a model.

(ii) Non-Road Emissions

(A) Trains

Growth factors for estimating projection year emissions were based on Salt Lake County's industrial employment growth derived from the Office of Planning and Budget's *State of Utah Economic & Demographic Projections 1994*, September 1994. Emissions were estimated to increase at the rate of employment growth within the Transportation, Communications and Public Utilities Segment of industry for the entire county.

(B) Aircraft

The Wasatch Front Regional Council (WFRC) provided growth figures for aircraft emissions in Salt Lake City. These growth figures were applied to the daily emissions calculated in the 1993 attainment inventory to obtain emission projections through the year 2006.

(C) Other Non-Road Engines

Growth factors for estimating projection year emissions were based on population growth derived from the Office of Planning and Budget's *State of Utah Economic & Demographic Projections 1994* and the incorporation of EPA's final rule for emission standards for new nonroad compression-ignition engines at or above 37 kilowatts (50 hp) (59 FR 31306). The final rule was posted in the Federal Register on June 17, 1994, and became effective on July 18, 1994.

FIGURE IX.C.26

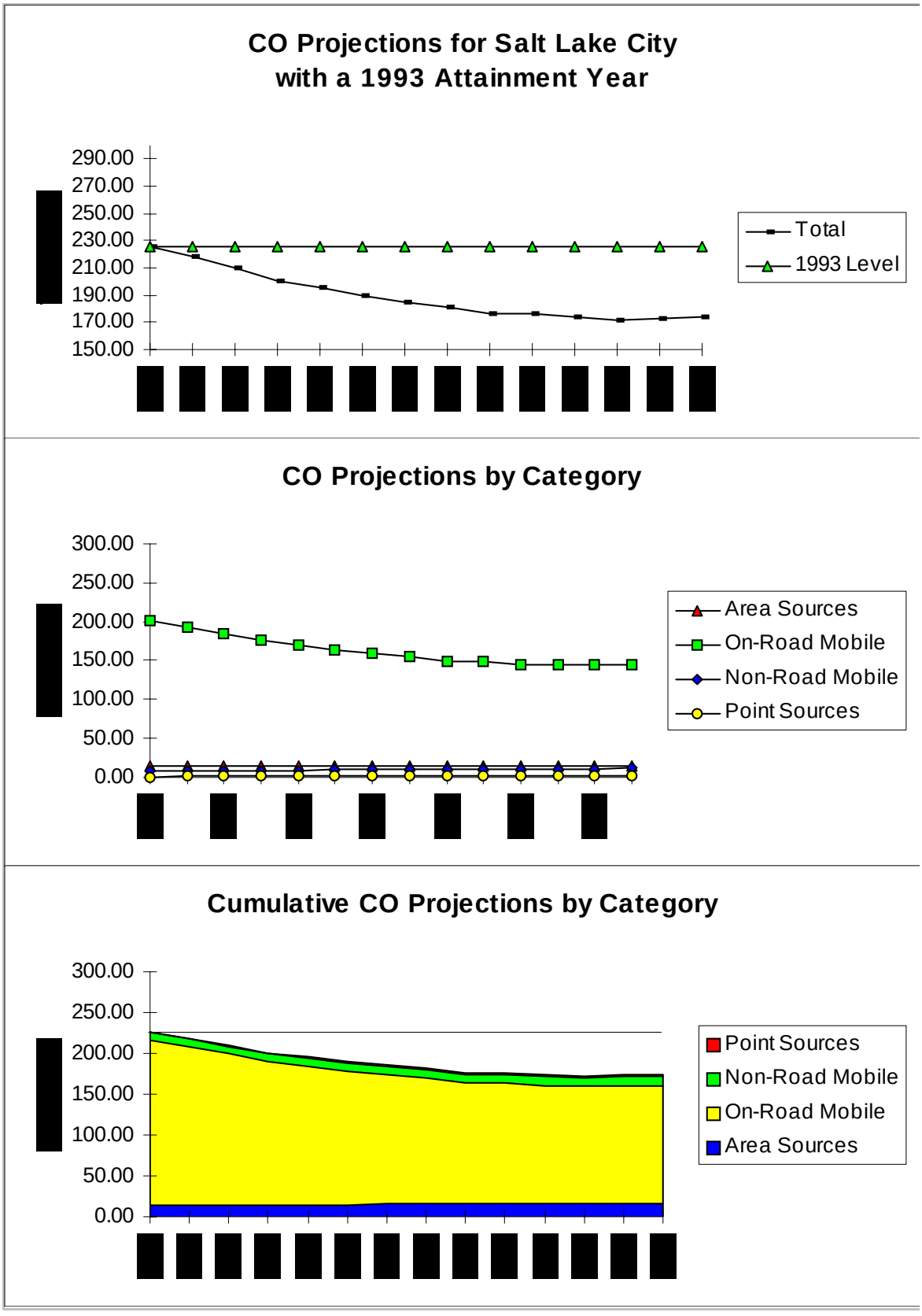


TABLE IX.C.35

		SUMMARY TABLE: SALT LAKE CITY - AREA, MOBILE, AND POINT SOURCES													
Growth		Daily CO Emissions, 1993 - 2006													
Code	CALENDAR YEAR	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
	Population Forecast (city)	160,233	160,858	161,485	162,115	162,747	163,382	164,019	164,659	165,301	165,946	166,593	167,243	167,895	168,550
P	Annual % Increase in Population (city)	0.00%	0.39%	0.39%	0.39%	0.39%	0.39%	0.39%	0.39%	0.39%	0.39%	0.39%	0.39%	0.39%	0.39%
	Population Forecast (county)	777,001	796,182	811,839	823,411	835,099	846,808	860,866	875,525	888,398	903,174	920,189	938,554	957,678	975,701
	Annual % Increase in Population (county)	0.00%	2.47%	1.97%	1.43%	1.42%	1.40%	1.66%	1.70%	1.47%	1.66%	1.88%	2.00%	2.04%	1.88%
	Aviation Operations Forecast (city)	178,640	179,320	180,000	184,600	189,200	193,800	198,400	203,000	206,700	210,400	214,100	217,800	221,500	224,700
A	Annual % Increase in Aviation (city)	0.00%	0.38%	0.38%	2.56%	2.49%	2.43%	2.37%	2.32%	1.82%	1.79%	1.76%	1.73%	1.70%	1.44%
	Industrial Employment Forecast (county)	207,435	215,309	220,661	224,378	228,515	231,617	235,222	239,262	243,747	248,231	252,716	257,200	261,685	266,817
I	Annual % Increase in Industr Emplmt (county)	0.00%	3.80%	2.49%	1.68%	1.84%	1.36%	1.56%	1.72%	1.87%	1.84%	1.81%	1.77%	1.74%	1.96%
	Commercial Employment Forecast (county)	227,660	237,857	246,659	253,521	259,841	265,005	270,698	276,605	282,867	289,129	295,392	301,654	307,916	315,197
C	Annual % Increase in Com Emplmt (county)	0.00%	4.48%	3.70%	2.78%	2.49%	1.99%	2.15%	2.18%	2.26%	2.21%	2.17%	2.12%	2.08%	2.36%
	TCPU Forecast (county)	32,737	33,288	34,388	35,255	36,039	36,662	37,318	37,991	38,715	39,438	40,162	40,885	41,609	42,522
T	Annual % Increase in TCPU Emplmt (county)	0.00%	1.68%	3.30%	2.52%	2.22%	1.73%	1.79%	1.80%	1.90%	1.87%	1.83%	1.80%	1.77%	2.19%
Growth															
Code	**AREA SOURCES**	**Tons/Winter Day**													
n/a	Orchard Heaters	n/d													
P	Woodburning/Fireplaces	13.58	13.64	13.69	13.74	13.80	13.85	13.90	13.96	14.01	14.07	14.12	14.18	14.23	14.29
P	Coal-Residential	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
C	Coal-Commercial	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
I	Coal-Industrial	0.28	0.29	0.29	0.30	0.31	0.31	0.31	0.32	0.33	0.33	0.34	0.34	0.35	0.36
P	Natural Gas-Residential	0.38	0.38	0.38	0.38	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.40
C	Natural Gas-Commercial	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
n/a	Natural Gas-Industrial	pt/s													
P	Fuel Oil-Residential	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
C	Fuel Oil-Commercial	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
I	Fuel Oil-Industrial	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07
P	Incineration	0.20	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.22
n/a	Forest Fires	n/d													
n/a	Firefighting Training	neg.													
n/a	Structural Fires	0.00													
n/a	Prescribed/Slash/Agricultural Burning	n/d													
n/a	Open Burning	n/d													
n/a	Detonation	n/d													
1% of aircraft	Aircraft/Rocket Engine Firing & Testing	0.06	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.10
n/a	Charcoal Grilling	n/i													
	TOTAL AREA SOURCE	*14.65*	*14.73*	*14.79*	*14.86*	*14.92*	*14.99*	*15.05*	*15.12*	*15.19*	*15.25*	*15.32*	*15.39*	*15.46*	*15.53*
Mobile5a	**ON-ROAD MOBILE**	202.24	193.95	184.84	175.30	169.56	163.90	158.80	154.66	149.13	148.45	145.64	143.79	144.66	145.37
	NON-ROAD MOBILE														
Separate, A	Aircraft	6.21	6.61	6.81	7.02	7.24	7.47	7.70	7.94	8.19	8.44	8.71	8.98	9.26	9.55
T	Railroad Locomotives	0.18	0.19	0.19	0.20	0.20	0.21	0.21	0.21	0.22	0.22	0.23	0.23	0.23	0.24
P	Misc Non-Road Equipment	1.90	1.90	1.91	1.92	1.93	1.93	1.94	1.95	1.96	1.96	1.97	1.98	1.99	2.00
	TOTAL NON-ROAD MOBILE	*8.29*	*8.70*	*8.92*	*9.14*	*9.37*	*9.61*	*9.85*	*10.10*	*10.36*	*10.63*	*10.91*	*11.19*	*11.49*	*11.79*
	POINT SOURCES	0.55	1.42	1.52	1.54	1.57	1.59	1.61	1.63	1.65	1.68	1.71	1.73	1.76	1.79
	TOTAL DAILY SALT LAKE CITY CO EMISSIONS	**225.73**	**218.80**	**210.07**	**200.84**	**195.43**	**190.09**	**185.31**	**181.51**	**176.33**	**176.01**	**173.58**	**172.10**	**173.36**	**174.48**

TABLE IX.C.36 CO Projections for Point Sources in Salt Lake City

CO EMISSIONS	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*
SALT LAKE CITY lb/day														
AMOCO	489.65	548.81	548.81	548.81	548.81	548.81	548.81	548.81	548.81	548.81	548.81	548.81	548.81	548.81
PACIFICORP-GADSBY	608.65	2292.20	2498.99	2541.08	2587.94	2623.07	2663.89	2709.65	2760.43	2811.22	2862.01	2912.80	2963.59	3021.71
COUNTY TOTAL(LB/DAY)	1098.30	2841.01	3047.80	3089.89	3136.74	3171.87	3212.70	3258.45	3309.24	3360.03	3410.82	3461.61	3512.39	3570.52
COUNTY TOTAL(TON/DAY)	0.55	1.42	1.52	1.54	1.57	1.59	1.61	1.63	1.65	1.68	1.71	1.73	1.76	1.79

(2) Conformity

Section 176(c) of the CAA states that "No department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve, any activity which does not **conform** to an implementation plan after it has been approved or promulgated under section 110." Section 176 (c)(2)(A) further states that no transportation improvement program may be adopted by a metropolitan planning organization "until a final determination has been made that emissions expected from implementation of such plans and programs are consistent with *estimates of emissions from motor vehicles - - - contained in the applicable implementation plan, - - -*." (Emphasis added) The purpose of this section of the Maintenance Plan is to provide emissions budget information to be used by metropolitan planning organizations or other entities seeking to demonstrate conformity as specified by section 176 of the CAA.

Emissions budgets are established in implementation plans and maintenance plans through the specific methods which the plan uses to demonstrate attainment and maintenance of the standard. In the case of maintenance plans, a September 1992, EPA memorandum, "Procedures for Processing Requests to Redesignate Areas to Attainment," drafted by John Calcagni prescribes the methods which can be used to demonstrate maintenance, and in so doing also prescribes by default the methods by which emissions budgets can be developed for use in demonstrating conformity.

The Calcagni memorandum directs that a state may "demonstrate maintenance of the NAAQS by either showing that future emissions will not exceed the level of an attainment inventory, or modeling to show that the future mixes of sources and emissions rates will not cause a violation of the NAAQS." The current Maintenance Plan utilizes the first of these two options. The attainment inventory approach has been used to demonstrate maintenance to the year 2006 (see Section IX.C.7.f). Emission budgets for the respective source categories, including on-road mobile sources, for the years 1994 through 2006 have been taken from the projection inventories for those years and are presented in Table IX.C.35. An emission budget for the period extending from 2007 to 2016 has been established. (See TSD) CO emissions projections for all source categories, excluding on-road mobile, for the year 2016 are 33.20 tons of CO per winter week day. When these projected emissions are subtracted from the 1993 CO planning cap of 225.42 tons of CO per winter week day, the result is an on-road mobile budget of 192.22 tons of CO per winter week day in 2016.

(3) Emissions Credit Allocation

The difference between each year's projected inventory and the 1993 attainment emissions level is called the "emissions credit" for that year. The emissions credit or any portion of it may be allocated to any source category contributing to the inventory; i.e., area sources, non-road mobile sources, or on-road mobile sources. The allocation of emissions credits shall be made by order of the Utah Air Quality Board and shall not be inconsistent with this plan.

IX.C.7.g. NEW REGULATIONS AND CONTROLS

Requirement Relating to New Emission Controls:

> - *The state must ensure that it has legal authority to implement and enforce all control measures for which emissions credits are assumed in the projection inventory demonstrating maintenance of attainment. (Calcagni, "Procedures for Processing Requests to Redesignate Areas to Attainment." pp 11, September 2, 1992.)*

Section IX.C.7.b of this plan identifies emission controls that are currently in effect and that have contributed to the air quality improvements in the 1993 inventory. No additional control strategies are needed.

IX.C.7.h. CONTINGENCY MEASURES

Technical Support Document, Volume I , tab 3

Requirement Relating to Contingency Measures:

> - *Section 175A of the Act requires that areas seeking redesignation from nonattainment to attainment develop contingency measures that include state commitments to implement additional control measures in response to future violations of the NAAQS.*

(1) Purpose of Contingency Planning

Section 175A(d) of the Act requires that maintenance plans submitted under this section include CO control measures necessary to assure prompt action to correct any violation of the standard which occurs after the area is redesignated to attainment. The maintenance plan is to include a state commitment to implement additional CO control measures not contained in the SIP for the area before redesignation to attainment. For attainment areas, additional controls are to be implemented in response to any CO violations which may occur in the future and/or increases in CO emissions that threaten the standard after an area is redesignated to attainment. The purpose of these controls in attainment areas is to achieve sufficient CO emission reductions to eliminate any further and/or future CO violations. Implementing controls in response to CO violations in attainment areas can occur without federal redesignation of the area to nonattainment.

The State collected information based on discussions and information from industry, metropolitan planning organizations, EPA and other states regarding the magnitude of CO emission reductions from various control strategies. The effectiveness and viability of possible control measures were compared. Some controls interact with other controls thereby decreasing the overall effectiveness. Estimates of the emission reductions expected from implementation of mobile source measures have been obtained from MOBILE5a estimates where applicable. The major considerations that went into choosing the following control strategies were:

- cost effectiveness,
- easily realized reductions with minimal lead-in time, and
- overall benefit of controls.

(2) Determination of Contingency Action Level

To ensure that the CO standard is maintained in the future, the State has identified two types of action levels that will be used to trigger Contingency Measures. The first is based on the emission inventory and represents maximum allowable CO emissions for the Salt Lake City CO nonattainment area. The second is based on ambient CO measurements, and represents exceedances of the NAAQS for CO.

(a) Emission Inventory Action Level

(i) Planning Cap Defined

The emission inventory action level is based on an inventory "planning cap" which corresponds to the peak CO season emissions, which were calculated in the 1993 attainment emission inventory. The planning cap is established for the entire CO nonattainment area of Salt Lake City, and is in terms of total tons of CO/peak season day (i.e., the cap is not category-specific). The planning cap is as follows:

CO planning cap = 225.42 Tons CO/peak season day

CO contingency measures would be triggered only if actual emissions exceeded the 1993 attainment emissions level as verified by the periodic inventory.

(ii) Exceedances of the CO Planning Cap

If the emission cap for CO has been exceeded, the Executive Secretary will take the following actions:

(A) Implement the CO Contingency Measures that are included in Section IX.C.7.h(3);

(B) Prepare a report that outlines the estimated peak CO season day emissions for the preceding winter and the actions that have been taken to implement contingency measures, including a schedule of future events. This report will be submitted to EPA, and to the Air Quality Board.

(b) Ambient Monitoring Action Level

(i) Violation of the CO NAAQS in One Year

The ambient monitoring action level will be triggered on the date that either of the following conditions are met:

-The second, non-overlapping 8-hour average ambient CO measurement exceeds 9 parts per million (ppm) at a single monitoring site during one calender year.

-The second one-hour average ambient CO measurement exceeds 35 ppm at a single monitoring site during one calender year.

(ii) Actions Taken if the Action Level is Exceeded

If the ambient monitoring action level is triggered, the Executive Secretary will take the following actions:

(A) Implement the CO Contingency Measures that are included in Section IX.C.7.h(3).

(B) Prepare a report that outlines the recorded ambient measurements of the CO standard, and the actions that have been taken to implement contingency measures, including a schedule of future events. This report will be submitted to the EPA, and to the Air Quality Board.

(3) Contingency Measures

Because projected CO emissions through the year 2006 remain well below emissions in the attainment year of 1993 (See Table IX.C.35), the State has chosen Alternative Commuting Options (ACOS) as the primary contingency measure. An Enhanced Inspection and Maintenance (EI/M) Program is included as a secondary contingency measure.

(a) Alternative Commuting Options

The goal of ACO Programs is to introduce and implement strategies designed to reduce the amount of measurable miles driven by employees commuting to and from work. The result would be heightened awareness of the direct relationship between driving and air pollution, and a reduction in the amount of vehicle-related pollution in Salt Lake City.

Rule R307-320, an Employer-Based Trip Reduction program for federal, state, and local government agencies with 100 or more employees at a worksite, has been adopted. The rule may be extended to include all employers with 100 or more employees at a worksite if determined necessary to maintain the NAAQS. The program for government agencies was implemented beginning in 1995.

The State recognizes that emission reductions will be achieved through alternative commute options, but these reductions have not been included in the projected emission inventory and credit for these reductions has not been included in this maintenance plan.

The State is able to use this program, which is already being implemented along the Wasatch Front due to requirements in other portions of this SIP, as a pre-implemented, over-control program for CO because no credit was taken for it in the emissions projections included in this portion of the SIP, and because pre-implementation and over-control programs are allowed as "contingency measures" by the federal government. Furthermore, the State believes that, due to the large margin of safety apparent in the emissions inventory projections, there is little likelihood that the contingency measures will be triggered in the 10 years of this maintenance plan.

The analysis assumes that all employers (government and private) with 100 or more employees would be formally involved in a trip reduction program, and that trip reduction would also occur on an informal basis with all other employers. (Rule 307-320 currently requires that government agencies with 100 or more employees participate.) To reach the target single occupancy vehicle rates for 2015, all aspects of an employer trip reduction program are assumed to be applied including telecommuting, increasing mode shares for transit, carpool/vanpool, and walking/bicycling.

Salt Lake City	2005	2015
Work Trips	271,000	308,000
Single Occupant Vehicle Rate	66.8%	60.7%
Tons Per Day Reduced Pollution	5.80	11.24

The trip reduction program target is a 20% decrease in the drive-alone rate. Following is a list of strategies that may be used for increasing vehicle occupancies:

A. Mass Transit
    a. Subsidized Bus Passes
    b. Worker Service/Express Buses
    c. Regular Bus Service
B. Vanpool/Carpool Programs
    a. No interest Vanpool program
    b. Vanpool Leasing Program
    c. State Motor Vanpool (for State Employees)
    d. Ridesharing
    e. Shuttle Service
C. Telecommuting
D. Compressed Work Week/Flexible Work Schedule
E. Worksite Parking Fees
F. Transportation for Business-Related Activities
G. On-Site Facility Improvement
H. Bicycling/Walking

Many of the above strategies have been or are in the process of being implemented for reduction of VMTs and the resulting emissions decreases from those VMTs. The State is continuing to work with the public and private sectors to ensure that all possible emission reduction strategies not being implemented at this time are being considered.

(b) Enhanced I/M or Equivalent

Technical Support Document, Volume 1, Tab 5

The Utah Legislature assigned authority and responsibility for the design, implementation, and operation of Utah's vehicle emissions inspection and maintenance programs to county governments. Section 41-6-163.6 of the Utah Code, as amended in 1994, provides the statutory authority for Salt Lake and Davis Counties to implement an enhanced I/M program.

The commissioners of Salt Lake County committed to implement Enhanced I/M or equivalent controls in a resolution dated October 11, 1995. A copy of the resolution is provided in the technical support document.

(i) Implementation Schedule

If a violation of the CO NAAQS is recorded after the implementation of the primary contingency measure specified in Section IX.C.7.h(3), an enhanced I/M program will be implemented. Salt Lake County has committed to implement, no later than two years after monitored violation of the CO NAAQS, I/M program improvements sufficient to achieve the emissions reductions specified in this plan. The program will meet the performance standard for an enhanced I/M program, as specified in 40 CFR 51.351, that does not include a purge pressure test.

The impact of the 2002 Olympic Games has not been specifically included in the emissions projections contained in this plan. The most accurate traffic and population projections currently available have been utilized for emissions projections. As new information becomes available related to potential air quality impacts of the 2002 Olympics, DAQ will assess the information and consider mitigation, if necessary, to ensure that ambient CO violations do not occur.

IX.C.7.i. MEASURES TO VERIFY CONTINUED CO MAINTENANCE

Requirement Relating to Verification of Continued Maintenance:

- *The maintenance plan must indicate how the state will track the progress of the Maintenance Plan.*

(1) Tracking System for Verification of Emission Inventory

Continued maintenance of the CO standard in the Salt Lake City nonattainment area depends in large measure upon the ability of the state to track CO emissions in future years. Consequently, the State will perform the following to verify maintenance:

(a) Every three years after the CO Maintenance Plan is approved by EPA, the State will submit a CO emission inventory to EPA by October 1st of the following year. These triennial inventories will follow the same procedures used to develop the 1993 attainment emission inventory, by applying the Inventory Preparation Plan and Quality Assurance Checklist. The triennial emission inventories will be based on the most current VMT data, actual point source emissions, and area source emissions founded on the most current population and industry growth information. This submittal will also include summary tables and graphs of CO comparing projected emissions with actual emissions. If there are major inconsistencies between the projections and actual emission calculations, the Division will analyze the discrepancies and initiate steps to try to correct the problems before the next CO season. As committed to earlier under section IX.C.7.f(4), the State will submit copies of the analyses and corrective action to EPA.

(b) Projects will be coordinated between the Compliance Section, the Toxics Program, and the Planning Branch to obtain more accurate information on area sources, and to update the yearly emission inventories to reflect the most recent emissions obtained from these sources. An example of this would be results obtained from the woodburning program and inventories. The Compliance Section would report any area sources which were found that were not part of the inventory at the time the maintenance plan was approved.

(c) The State will coordinate the efforts of the Operating Permit Program with the Planning Branch. Inspectors and emission inventory personnel will monitor sources to verify all major point source emissions, as well as a percentage of area source emissions reported in the emission inventory and/or their operating permits.

(d) Projects will be coordinated between the Engineering Branch and the Planning Branch. By using the comprehensive engineering tracking system, the Planning Branch will be informed of all NOI's that have been submitted, new sources that receive approval orders, and sources that fall below the de minimis limit for approval orders. This tracking system will reveal estimated emissions, modifications, etc. that should be tracked and reflected in the emission inventory for the Salt Lake City area.

(2) Analyze Ambient CO Monitoring Data

The State will analyze the ambient CO monitoring data with respect to the level of the CO standard and log the data into AIRS. Exceedences of the standard will be reported to EPA.

(3) Annual Review of the CO Monitoring Network

The State will continue to evaluate the ambient CO monitoring network to ensure that the network meets all applicable federal regulations and guidelines. The results of this evaluation will be submitted to EPA by June 1st of each year in the annual Network Review.

(4) Provisions for Revising the Maintenance Plan

The State will revise the Plan as necessary in response to revisions of the national primary ambient CO standard, or to take advantage of improved or more expeditious methods of maintaining the standard. The State will also revise the Plan as necessary to comply with the EPA's finding that the Plan is inadequate to attain or maintain the national ambient standard, or every eight years in compliance with Section 175A of the Act.

(5) Provision for Prohibiting Emissions That Interfere With Attainment In Other States

The State will take steps as necessary to prohibit emissions within the state that have been shown to interfere with attainment or maintenance of a NAAQS in another state.